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TECH: CAN IT TURN US AROUND?

SPECIAL ADVERTISING SECTION: MATERIAL HANDLING AND THE FACTORY OF THE FUTURE

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IRON AGE

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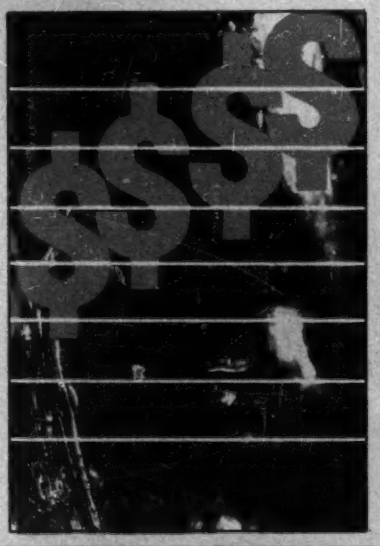

COVER STORY

47 CAN HI-TECH TURN US AROUND?
Although our expectations of new technologies are high, these industries won't transform the economy singlehandedly. They simply can't grow fast enough and large enough to pick up all the slack. High-technology and basic industries on the same side of the equation, though, can add up to economic survival.

FEATURES

20 FEDERAL JOB TRAINING NOW A PARTNERSHIP ACT
Business and government have taken a small but important step toward cooperative rather than adversarial relations by joining forces in the new Job Training Partnership Act. Initial indications are that the partnership is succeeding.

23 WILL THE RECOVERY REFUEL INFLATION?
It's happened in the past. But the best guess by some top-rated money analysts for 1983 is that interest rates will stabilize and the rebound won't blow itself out this time.

NEWSFRONTS

7 EDITORIAL
Why we need basic industries more than ever.

12 METALWORKING NEWSFRONT
The Reagan Administration opens a new front in its battle to block the sale of Western technology to the Soviet Union.

64 PRODUCTS NEWSFRONT
G.E. adds two small, powerful PCs to fulfill the needs of any user—from systems requiring four relays to 4,000 I/Os.

71 MATERIALS NEWSFRONT
Steel order pace supports mill volume, but market still lacks strength. Further upturn necessary to make steel profitable.

76 METALWORKING ORDER TRENDS
The latest monthly report on orders shows they slipped a bit. But almost all slippage was in super-volatile defense orders.

DEPARTMENTS

8 EDITORIAL STAFF
11 LETTERS
66 BUSINESS STAFF
66 AD INDEX
67 MANAGEMENT SERVICE CARD
73 P&P DATA 3/28
74 FERROUS SCRAP 3/28
75 CLEARING HOUSE

NEXT ISSUE

Manufacturing Systems Series 39: The scramble to stay ahead in the robot industry

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facility near Rocky Mount, N.C.

The new B and C Series diesel engines to be produced at the plant will allow Cummins to expand its product line down to 50 hp by 1986.

Manufacturing will be at a much higher volume (150,000 units a year) than anything Cummins has done previously. To achieve that output, the firm decided to use transfer lines and manufacture only blocks, heads and rods. Because the lines permit little manufacturing flexibility, engine variation will begin on the assembly line. An even broader range of products will be assembled by distributors from kits supplied by Cummins.

The new plant features an 18-machine cylinder block line from The Cross Co., Fraser, Mich., a cylinder head line by F. Joseph Lamb Co., Warren, Mich., and a connecting rod transfer line from Alfing Kessler, West Germany.

Speeding up production has made Cummins rethink many of its manufacturing philosophies. "Test cells, for example, used to require that completed engines run an hour or an hour-and-a-half, in order to check performance. We had to get that time down to six minutes," said Philip E. Jones, vice president of engine projects.

"In addition to new products in our traditional heavy-duty markets, development of our new B and C series engines to serve the light- and medium-duty markets from 50 to 250 hp is on schedule," said James A. Henderson, president. "The first model, a four cylinder B engine for light industrial equipment will be in production in July."

GMF Robotics expects to lead market by 1985

GMF Robotics, the joint venture between General Motors and Fanuc of Tokyo, plans to be the top seller of robots in the U.S. by 1985. The company predicts it will capture 27.5 pct of the U.S. robot market that year.

GMF plans to break ground this year for a new plant in the Detroit area that will be completed by next year. The plant, which initially might cover 60,000 sq ft and employ 50 people, first would assemble robots; later, it would expand to do machining operations, too.

GMF presently assembles only the numerically controlled paint sprayer in the U.S. That's done in the Detroit area. All the other GMF products are made in Japan.

Presently, General Motors accounts for 75 pct of GMF's sales.

"We won't be comfortable," says Philip V. Monnin, vice president, sales, GMF Robotics, "until GM accounts for less than 50 pct of our sales."

GMF presently is negotiating with Ford for a number of products. GMF would like Ford to use its paint sprayer to paint one of the new Ford models. Ford already is using a Fanuc robot in its plant in Batavia, Ohio.

In Europe, GMF has sold its paint sprayer to Daimler-Benz and BMW.

Fanuc robots probably will account for 80-90 pct of GMF's total sales through 1985, estimates Mr. Monnin. In 1982, GMF sold 50 Fanuc robots and 40 painter arms. So far in 1983, GMF has sold 99 Fanuc robots and four painter arms.

GMF's view of the robot market and its share

	Robots sold by total U.S. industry	Robots sold by GMF
1982	3075	90
1983	4000	900
1984	5600	1300
1985	8000	2500

Fanuc alone already has captured 50 pct of the world market for numerical controls. It has 50 pct of the U.S.; 50 pct of the European and 75 pct of the Japanese market for numerical controls.

"In the U.S.," says Mr. Monnin, "Fanuc outsells Allen-Bradley, GE, Bendix, and Westinghouse all put together."

Fanuc, then, brings its expertise in hardware to the joint venture. GM's contribution is its expertise in software.

GMF's strength as a robot maker is its wide range of products and low prices. It has 17 basic robots. By contrast, Asea and Cincinnati-Milacron offer three basic models.

By 1983 to 1984, says GMF Robotics President Eric Mittelstadt, the S3 robot will account for about two-thirds of GMF's sales. The S3 is intended primarily for spotwelding.

The S3 is one of the products developed jointly by GMF since it began last year. The project began in August, 1982 and was finished by the end of 1982.

"That's a phenomenal development time," says Mr. Monnin. "The competition would take 2½ to 3 years to develop the same product."

The GMF product line ranges from the simple, air-operated Model M-00, which sells for a base price of $14,000 and is used to load and unload, to the numerically controlled paint sprayer developed by GM.

West Coast company resurrects the Bug

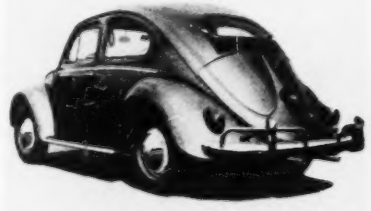
The Volkswagen Beetle seemed to win a fond place in many American hearts—at least until 1977 when the automaker stopped exporting them to the United States and hatched plans for the more expensive and redesigned Rabbit.

Now a California entrepreneur has resurrected the popular bug. A Solana Beach, Calif. company called People's Car Co. has discovered a supply of new VWs in Puebla, Mexico, near Mexico City and is importing the workhorse vehicle into the U.S.

Lenny Macchiarella, who owns the company, says he discovered that new Beetles still were manufactured at the Mexican facility during a recent trip south of the border.

Mr. Macchiarella and a business partner, Danny Nager, learned that only Mexican citizens could buy the car at a price of about $3,800. They have arranged for a Mexican company to purchase the vehicles, have filed the necessary paperwork with U.S. Customs and have contracted with a Newport Beach company to make the necessary modifications to bring the Mexican Beetles up to compliance with U.S. safety and environmental regulations.

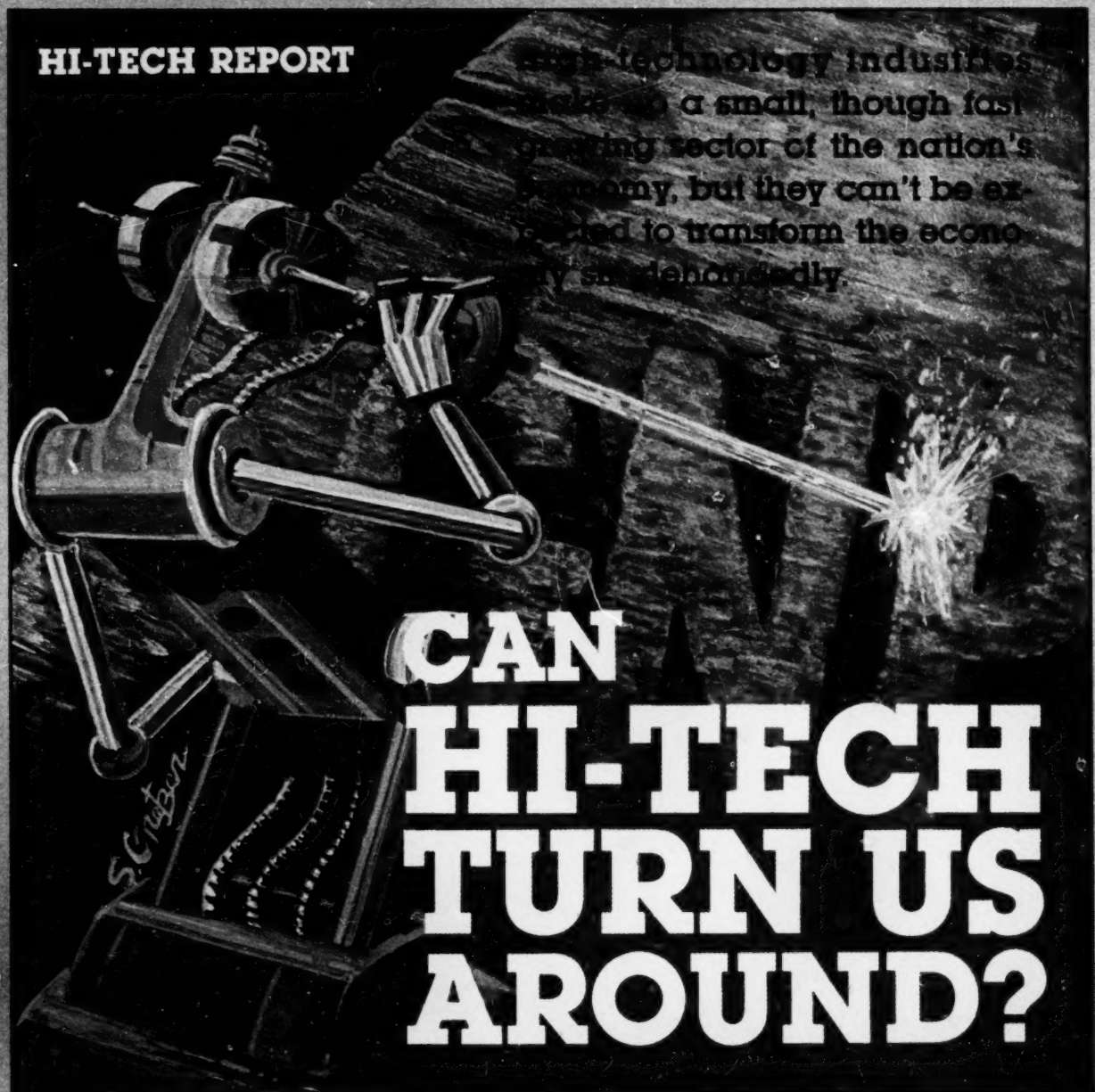
It would probably cost an individual owner up to $7,000 to make the necessary modifications on the car, but by dealing in bulk Mr. Macchiarella has cut the cost to about $2,500. The Beetle retails through People's Car for $6,995. Options can up the price to $9,500.



Could this be the newest auto import threat to worry Detroit?

Volkswagen of America won't give U.S. owners a warranty on the Mexican cars, so People's Car guarantees the auto's performance for 12 months or 12,000 miles.

A full-scale Beetle revival is probably a long way from occurring, however. Mr. Macchiarella will sell only about 400 of the cars this year and perhaps 1,000 annually later.



CAN HI-TECH TURN US AROUND?

BY LESLIE GOLDWATER

High technology: Managers, workers, politicians and economic planners across the land see it as the great savior come to rescue us from the ill fates of recession and industrial decline, and lead us into the promised land of economic growth and prosperity.

That is the hope—here are the facts: High-technology goods contributed to about 8.1 pct of the gross national product (GNP) in 1980, or about 25 pct more than they had a decade before. High-technology industries accounted for 75 pct of the net increase in *manufacturing* jobs from 1955 to 1979, according to a study by the Joint Economic Committee of Congress. Perhaps most significant for the long term, 23.2 pct of high-technology industries' value added was spent on research and development (R&D) in 1980, as compared to 7.2 for all manufacturing industries.

No wonder everyone's trying to jump on the high-technology bandwagon. But how many of us can it hold and how far will it take us?

There is increasing concern that the new glamour industries will not bring the economic salvation being promised, that the "numbers" are deceptive, that the growth simply will not provide sufficient jobs for the American people. The recession has shown that even high technology is not immune to economic pneumonia.

Before we can analyze what high technology can or

(Cont. on p. 49)

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cannot do for our economy, and what its effect will be on metalworking in particular, we first have to decide what high technology is. Despite widely varying perceptions and definitions, there are some areas of consensus. High-technology companies generally are agreed to be labor- or brain-intensive rather than capital-intensive; science-based, or involving applications of scientific advances; employing scientists, engineers and technicians; and having a high R&D component. (For a thorough discussion of the definition, see box, p. 53.) The industry stretches all the way from guided missiles to synthetic insulins to desktop computers, with hundreds of products, hard and soft, in between.

Most economists see high technology as having strong long-term potential in light of all industries' concern with cutting costs while improving productivity, quality and efficiency. Their enthusiasm for hi-tech is tempered, however, by some of the realities.

"Anyone who believes it is the solution for all our problems is enormously exaggerating," says Lawrence Chimerine, chairman and chief economist, Chase Econometrics. "It is still a fairly small sector, it's not highly employment-intensive and there's lots of competition, including foreign," he adds.

"The expectation that high technology is going to bail out the economy, frankly, is unrealistic," says John Albertine, president of the American Business Conference, whose members are small and mid-sized high-growth firms.

Layoffs of thousands in the semiconductor industry last year proved painfully that the recession would penetrate, though less quickly and severely, the high-technology bubble. After years of spectacular growth, the semiconductor industry was flat last year, though the imminent economic recovery promises a new spurt of growth. Other hi-tech industries also suffered temporary setbacks during the recession.

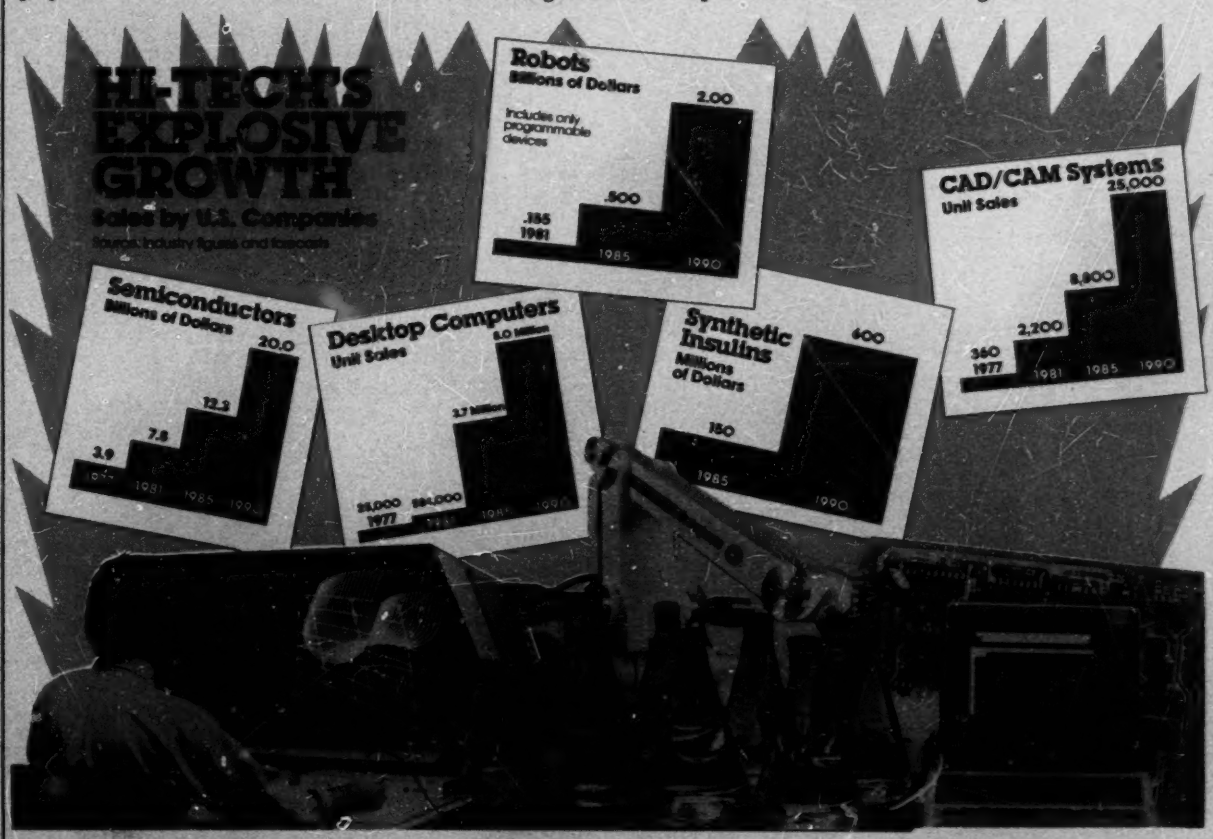
High technology is subject to the winds of trade and competition, as well as to the vagaries of economic cycles. Competition already is making it difficult for new entries in certain hi-tech industries. Some 36 states and innumerable counties and cities have established hi-tech development commissions to attract the new industries (see box, p. 57). Foreign competitors are breathing down the necks of U.S. manufacturers.

The strong dollar has helped make American products expensive abroad and foreign imports cheaper. Hi-tech is feeling the heat.

Howard Foley, who heads the Massachusetts High Technology Council, says there's always a danger that foreign competition will overwhelm the U.S. industries, but he sees substantial changes ahead in the international business structure that may make foreign competition a non-issue.

"When you follow this down, we're not going to see U.S., French, German or Japanese companies. We're going to see companies employing the best possible talent from around the world," predicts Mr. Foley. "It's going to be companies against companies, not countries against countries," he adds.

Mr. Foley, like his counterparts across the country, sees hi-tech as one means for transforming a local economy's dependence on mature industries. New England provides a unique example of just how hi-tech growth has affected a traditional manufacturing economy. Bennett Harrison, an economist at Massachusetts Institute of Technology, studied the economic changes occurring in the region since World War II, and found that perhaps the new industries have not entirely revitalized the region.



In his three-year study, Dr. Harrison found that "for all the attention it has commanded, the high-tech sector has not yet achieved the dominance once held by the mill industries." While acknowledging hi-tech's significant growth in New England, Dr. Harrison points out that "between 1976 and 1978, in the most important high-tech state in the region, three new jobs were created in other segments of the private economy of Massachusetts for every new job created in high tech."

He adds that the region continues to have the lowest real wages in the U.S., for all occupations. And the outlook indicates an increase in the geographic dispersal of jobs from New England-based high-technology firms. The study's conclusions do not necessarily provide a model for what may occur in a transformation of the entire economy of the nation, but they do offer evidence that high-technology industries will not solve a slew of economic problems faced by local economies once dependent on traditional manufacturing, and even positive effects will be gradual.

How long before the growth of high technology will have a significant impact on our economy? There is some disagreement among experts as to the size and timing of the impact, but most agree that the effect won't be felt quickly.

"In the short range, the unemployment problem will lag a long time, as the young come into the job market and older workers are not reabsorbed," says Dan Berg, provost, Carnegie-Mellon University. "But I am very optimistic. It may take five or ten years to hit the market, but there's already a rejuvenation going on," he adds. John Albertine says the impact is "ongoing, but the major benefits are a decade away."

The phenomenal growth rates in high technology may level off in specific areas as some current technologies are made obsolete by new, even higher technologies. Dr. Chimerine forecasts that in 10 to 20 years, the spectacular growth of personal computers will slow, while the mainframe market already has slowed considerably. Communications, cable television, transmission of data, etc., will continue to grow for a long time—"it's a big, untapped market," he says. Biotechnology is such a new field that it's peak is quite far off.

Far-off results haven't scared off the politicians. Many are adopting technology-focused industrial policies as the cornerstone of their platforms. Some of the so-called Atari Democrats hail from the hi-tech centers—Sen. Gary Hart (D., Colo.), Sen. Paul Tsongas (D., Mass.), Rep. Leon Panetta (D., Calif.); others from traditional manufacturing states that are trying to change their image—Sen. Bill Bradley (D., N.J.), Rep. Howard Wolpe (D., Mich.), Rep. Richard Gephardt (D., Mo.).

A bipartisan group from Congress formed an economic task force last summer to analyze the "engines of post-war economic growth" and determine whether the new technology industries can power our economy into the next century. The conclusions of the study's first phase credit the auto-highways-housing relationship with seeding the economy of the last three decades; the second part of the study will evaluate high technology as a potential replacement.

Even if the government's industrial policy readjusts the balance of efforts and resources toward high-technology and basic industries, the two will maintain a certain symbiosis, a mutual dependence for survival and growth.

Hi-Tech vs. the Basics

Some are drawing economic battle lines of hi-tech vs. basic industries. A closer look reveals a mutual dependence of the two.

The efforts to redirect resources to the development of high-technology industries are, unfortunately, often characterized as a contest between hi-tech and basic industries. Ironically, advanced technology may be a blessing, not a threat, to our older industries. It is emerging as part of a solution for improving the quality and efficiency of our basic industries, not for replacing them.

That point has not been lost on leaders in those industries. "Let me state in very strong terms that anyone who sees the future of our economy as a contest between high-tech and basic industry has some rethinking to do. Advocating the abandonment of basic industry in favor of technology and service industries suggests the advocate is either a fool or an idiot," said David M. Roderick, chairman, U. S. Steel Corp., in a recent speech.

Philip Caldwell, chairman of Ford Motor Co., said at the 1982 annual meeting, "Whether it is in quality or product leadership, or in manufacturing efficiency, technology is fundamental to success."

Gerald Michael, of Arthur D. Little Inc.'s CIM (Computer-Integrated Manufacturing) Group, says that in a difficult economic climate, it is understandable that the public perceives hi-tech as threatening. "Once things turn around, people will realize that new technologies improve productivity, that they create, not take away, jobs. Over the past decade, in automotive, job loss was the result of lack of productivity, not automation. . . . High technology can stem that tide, in fact, turn it around, by allowing goods to be produced at a higher quality for a lower price," explains Dr. Michael.

Near elimination of basic manufacturing would greatly reduce the domestic market for hi-tech goods, forcing hi-tech producers to look for markets abroad where they would meet tough foreign competition. Clearly, it is to the benefit of high-technology industries that the U.S. maintain a substantial manufacturing base to serve as a major market for hi-tech products.

Frederick Gander, Jr., a consultant with Arthur D. Little's Resource Consulting Group, points out that in the future capital goods will be more electronic-intensive than metal-intensive, but that metalworking industries will continue to be an important factor in the capital goods market. In fact, basic industries are already valuable customers of hi-tech goods. The auto industry alone has invested millions in new technologies. Ford has 400 computer-aided design (CAD) stations worldwide. The company says that it has produced more automotive body tooling using CAD-CAM technology than any other company in the world. General Motors Corp. expects it could be using 5,000 robots by 1985 and 14,000 by 1990.

Automotive industry needs have inspired many new technologies and the applications for them, from programmable controllers (PCs) to welding robots. "Unquestionably, applying the latest technology is crucial to our effort toward improving productivity—the next signpost in our thinking and planning for the future," says Mr. Caldwell.

The nation's auto industry is not only a major user of high technology, but also a developer of advanced technologies, for use both within the industry and as a separate, diversified part of its business. Interestingly, Ford was ranked second in the nation in total spending for R&D in 1981, and was first in R&D expenditures as a percent of sales, with much of the work in hi-tech areas. General Motors sees potential

Is a broom hi-tech?

"High technology is a dangerous term," says David Birch, an engineer who directs the program on neighborhood and regional research at the Massachusetts Institute of Technology (MIT). "It has no meaning to me. Talk to ten different people, and you'll get ten different definitions. By definition that means the term has no meaning."

Many people understand high technology to mean a clean manufacturing company that's based on research and development and that makes a high-valued product, usually electronic or bioengineered. That's too narrow a definition, says Mr. Birch and D. Bruce Merrifield, assistant secretary for productivity, technology, and innovation, U.S. Dept. of Commerce.

"I prefer to use the term advanced technology," says Mr. Merrifield. "High technology is just one small part of the big picture of systems analysis.

"High technology is a buzzword that doesn't mean a great deal. It isn't really useful to distinguish between high and medium and low tech."

If the definition above is too narrow, other definitions may be too broad.

The staff of the Michigan Technology Council (MTC), based in Ann Arbor, searched libraries but couldn't find a definition. Finally they came up with three alternative definitions, says G. William Ince, president, MTC:

—"the application of the most advanced knowledge to a production or distribution process";

—"the adaptation and use of old technologies in new ways or in new combinations based on new scientific findings";

—"elegance of design, simplicity of construction and application, reliability in use, and low expense in terms of the job performed." The last definition is by Dr. Eric Rabkin, professor at the University of Michigan.

"All those definitions are true of a broom," rejoins Mr. Birch. "A broom applies the most advanced knowledge of sweeping. It's designed very elegantly and performs its function beautifully."

"My concern is to stay away from the sexy word 'high,' " says Albert A. Bogdan, head of Michigan's office of economic development. Last year he served on Michigan's High Technology Task Force. "We almost got them to change their name," says Mr. Bogdan.

"Some people within the group made a strong argument that the name really should have been the Michigan Technology Development Corp. Technology is a continuum on which it's hard to separate high from low. High and low aside, we need technology to develop products and improve productivity." Like Mr. Merrifield, Mr. Bogdan emphasizes that managing existing technology is as important as finding new technologies.

"High-technology firms are labor-intensive rather than capital-intensive," says a staff study on high-technology firms prepared for the subcommittee on monetary and fiscal policy, Joint Economic Committee, U.S. Congress. "They employ a higher percentage of technicians, engineers, and scientists than other manufacturing companies. The industries are science-based in that they thrive on the application of advances in science to the marketplace in the form of new products and production methods. R&D inputs are much more important to the continued successful operation of high-technology firms than is the case for other manufacturing industries."

This definition could give the impression that high-tech firms employ mainly highly trained engineers. This is not so.

"Most of the jobs created by hi-tech firms," says Mr. Merrifield, "are not hi-tech at all. They're supportive. Some statistics show that the businesses we think of as hi-tech employ 10 pct highly trained, hi-tech personnel and 90 pct supportive people doing relatively low-tech work." Other statistics show that every hi-tech position generates six to ten supporting jobs.

What specific businesses do people call hi-tech? Some of the leading companies of North Carolina's Research Triangle do: telecommunications equipment, digital switching equipment and computer R&D; research on human health, environment, pharmaceuticals, biomedicine and synthetic fibers; and engineering services.

Other fields that have been classified as hi-tech: robots, computer-aided design and manufacturing, and automated systems; lasers and optics; semiconductors, computer-aided instruction, office machines, typewriters and photographic equipment; genetic engineering—using new strains of microorganisms for agriculture, human health and even such industrial uses as mining; composite and other new materials; and aerospace, including aircraft and complete guided missiles.

One way to define a hi-tech company is by how much money it spends R&D. Hi-tech companies spend 8 to 10 pct of gross sales on R&D, says the Michigan Technology Council.

Product lifetime might be a better guide.

"I would group businesses according to their product obsolescence rate," says Mr. Birch. "If a business requires a lot of innovation to succeed, there's a good chance it will succeed in the U.S. But if a business does something routine, there's a good chance that a machine, such as a computer or robot, or someone abroad will take over that job.

"High technology represents a very small segment of a very important sector of our economy that I call the high-thought-content sector or high-innovation sector. This larger sector includes medicine, law, pharmaceuticals, hospital management, printing, publishing, and architecture. Innovation occurs at a rapid rate. Computer software lasts 1½ years; a newspaper, one day. Architecture and engineering require continual upgrading. Federal Express and American Express are high-thought-content firms," says Mr. Birch.

"The basis of these high-thought-content companies is thinking. You need a cadre of very bright and well-trained people to create systems. Since brains are your chief resource, many of these companies are located near universities. That's why in Pennsylvania, Philadelphia is one place with relatively low unemployment; in Massachusetts, Boston; in Kentucky, Louisville; in Michigan, Kalamazoo; in Ohio, Columbus," points out Mr. Birch.

In the 1950s and 1960s the construction of the interstate highway system, says Mr. Birch, made possible suburban shopping malls and a host of such businesses as McDonalds. Similarly, advances in flexible microprocessors and genetic engineering could alter the American scene and spawn a host of supportive industries.

Bryan Berry

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not only in the increased use of automation in auto production, but also in developing and manufacturing such equipment for its own and other industries. The automotive giant joined forces with Japan's Fanuc Ltd. to form GMF Robotics Corp. The new company will design, manufacture, sell, distribute and service flexible manufacturing systems for a wide range of industrial customers.

General Electric Co., with a long history of technological innovation, is working to integrate high technology into some of its own operations, as well as into those of its customers. The company is investing $316 million in the most advanced equipment available to upgrade its aging Erie, Pa., locomotive factory. The shells of the buildings—some of which date back to the 1900s—will mask the latest in robots, programmable controls, computerized machine tools and other automation systems. GE expects the market for locomotives to revive, and they want to be ready with the newest, most cost-efficient technology when it does.

The enthusiasm generated for hi-tech is contagious, but most politicians and economists recognize the importance of a core of basic manufacturing to meet the nation's industrial and defense needs. The United States has long attached value to self-sufficiency. The consensus ends with that goal; the differences begin with how to achieve it.

Dr. Albertine believes that currently we are seeing a battle over limited resources, with hi-tech often winning. He says that economic recovery, along with lowered interest rates, will result in an easing of capital. And that will benefit all industries, including basic. The market forces at work.

Ira Magaziner, a Rhode Island-based industrial policy consultant, thinks the situation in basic industry has deteriorated too far for the marketplace to correct on its own. He suggests aid and incentives from the Government targeted for industry to build new, technologically state-of-the-art plants. "We have to become competitive in these industries," he says. "There's no reason why we have to abandon them," he adds.

Becoming competitive once again in our basic industries by using higher technology may not result in the rehiring of all those workers displaced during this recession; remaining uncompetitive, the experts say, surely will result in still more job losses and erosion of the nation's economic base.

Employment

The two extremes have hi-tech either stealing jobs from people or providing all jobs of the future. The truth lies somewhere in between.

Two schools of thought have emerged on the issue of high technology's effect on employment: those who think hi-tech only will eliminate jobs and take away opportunities to make a living vs. those who see hi-tech replacing basic industries as the great provider of jobs in this country. Both are distortions. To gain perspective, we should ask: How many jobs will hi-tech growth create; how many will it eliminate through advances in robotics, CAD-CAM, CIM, etc.; and how many workers will make the transition from old to new industries? Or, what's the net impact?

"People who say we can go to hi-tech heaven are dreaming. Put all the high-technology people together and it still equals only 10 pct of the number em-

(Cont. on p. 58)

Hi-tech will carve new jobs, but not enough for all those displaced from basic industry.

Who will catch the hi-tech bandwagon?

There's only limited space aboard the hi-tech express, but some areas already have a real leg up on the competition. They offer many of the key resources—labor force, quality of life, educational support—that spawned Silicon Valley, Route 128 and Research Triangle Park.

Florida, stung by the 1974 recession and its dependence on tourism and construction, is running very hard in the race to attract new, "clean" industries. The state already boasts a "Silicon Coast" from Miami to Palm Beach, represented by IBM, Harris Corp., Motorola and Racal-Milgo among others. To the north, it's the Space Coast and more electronics, and on the west coast of Florida, still more electronics and defense technology companies.

Maury Hagerman, of the state's Bureau of Economic Analysis, estimates Florida's high-tech companies directly contribute $2.7 billion annually in salaries and 25 pct of all manufacturing jobs in the state. Florida estimates the number of high-technology jobs there jumped from 55,000 in 1975 to 110,000 in 1981, double the number employed by similar North Carolina firms.

Florida Gov. Bob Graham wants the state to continue shining. In his 1983-85 budget recommendations, he proposes $85 million for enhancing math/science programs in schools and community colleges; $20 million for university engineering programs; plus $3 million for promotional programs to attract high-tech firms to the state.

It should come as little surprise that Texas, too, has its contenders. Austin began twenty years ago to reduce its dependence on the public sector (the state capital, state university and Federal government) by attracting private industry. With 50 pct of its land government-owned and generating no tax revenues, Austin needed to expand its tax base. High-tech firms, primarily semiconductor producers, are doing just that. Motorola and Data General have facilities; Lockheed Space and Missiles opens a facility shortly. The city is using its university-trained workforce, quality of life, and already-strong base of high-tech firms, not tax incentives, to attract still more.

Ed Brady of the city's Chamber of Commerce, emphasizes Austin wants to import jobs, not people. "We're looking for companies that want to expand, not those who will close up shop, move their people, and reopen here. So far, 90 pct of the new jobs created have been filled locally," says Mr. Brady.

From the looks of things, John Naisbitt's prediction in *Megatrends* of the coming three mega-states—California, Florida and Texas—may not be farfetched. But don't discount those Northern states so fast. In fact, a Congressional study on the location of high-tech firms found the Midwest leads the way among regions expected to win the lion's share of such new plants and offices.

Dayton, Ohio, is capitalizing on its resources in place—a large, highly trained work force of scientists and engineers, the Air Force research facility at Wright-Patterson AFB and a strong educational system—to develop and attract high-tech industries. Much of the growth is the result of commercial spinoffs from R&D projects at Wright-Patterson; the city is helping local entrepreneurs with startups.

"We're not trying to create an asset and build around it, as many cities are doing," says Tom Ferguson of the Dayton Development Council. "We're trying to sell those resources—human and natural—that we already have." A survey to explain the low (5 pct) annual turnover among its 20,000 scientists and engineers, pointed to the "challenge of the work" in Dayton, being on the leading edge of new technologies. Mr. Ferguson projects private hi-tech employment in Dayton to grow 30 pct annually for the next three years.

A number of other cities are making the high-tech pitch successfully, as well. Syracuse, N.Y., already employs a high percentage of it residents in high-tech jobs, including 7,000 by General Electric. The university's work in artificial intelligence and software computer applications is one magnet; medical technology companies, led by Bristol Laboratories, are attracted by the new state medical school.

Worcester, Mass., a former mill town, is attracting biotechnology firms to augment employment provided for years by Norton Co. and Wyman-Gordon. The state medical school, Clark University, and nearly a dozen other colleges and library support, plus community cooperation, are the "magnets critical to the development process of such industries, aside from the conventional tax incentives," says Dr. Abraham Haddad, chairman of the committee to develop a high-tech park in the city.

Cleveland is proposing a new research center for manufacturing technology, drawing on the resources and expertise of local universities and companies, including White Consolidated Industries, Warner & Swasey, Acme-Cleveland, TRW, General Electric, Reliance Electric and Republic Steel.

Albuquerque, N.M., Tucson, Ariz., and Colorado Springs, Colo., are new competition in the Southwest. In the East, northern New Jersey and Long Island are quietly attracting high-tech businesses who want the closeness of New York and its resources, without the problems.

Ted Levine, whose company Development Counsellors International, Ltd. specializes in providing support for economic development programs, cautions all the newcomers: "Don't put all your eggs, or even most of them, in the high-tech basket. It's a very small basket." He adds that areas with the greatest chance of success are those that carefully determine their in-place assets, conduct an exhaustive inventory of their work force and skills, and put an emphasis on home industries—developing and keeping them—not attracting new ones to build around.

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ployed by the auto industry," points out Mr. Magaziner.

"The problem in Michigan is if people think high technology is going to replace the auto industry as a major employer, they're off base. They are never going to be able to hire 250,000 laid-off auto workers in high technology," according to Shelby Solomon, policy advisor to Michigan's Gov. Blanchard. "We want to pursue hi-tech, but only as part of the strategy for improving the state's economic situation. It's not the solution to the whole problem," he adds.

"There's no way high technology and jobs can grow fast enough to offset those other job losses," says Dr. Chimerine.

Already we are seeing some exporting of high-technology production jobs. Atari sent shock waves with its decision to move 1,700 California assembly jobs to Asia. Apple Computer and Wang Laboratories already do preliminary assembly work in the Far East. Semiconductor producers, including Intel and National Semiconductor, went overseas a while ago for some of their operations. As the manufacturing of many hi-tech products is streamlined and fewer skills are required to make them, producers naturally will export the jobs to countries with lower labor costs. It is an evolutionary process that has affected all our industries from textiles to televisions. Not everyone sees it as negative.

"Our comparative advantage in this country is not in mindless work but is, in fact, in high-thought-content activities. Those that are not will be exported to countries with lower training rates and, therefore, lower wage rates," explains Dr. Albertine. "That good. It forces our people to move into activities where we do have a comparative advantage," he adds.

Dr. Michael sees the natural evolution as taking a twist in the not-so-distant future. "It will be different over the next 15 years, because computer technology is opening up completely new doors. The choice now is, 'Do I make it here manually vs. making it manually in Southeast Asia for much less?' Soon, there will be a choice for making it again here, with automation. Automation will be a new justification of keeping business here," predicts Dr. Michael. While automated factories might not mean a significant direct increase in jobs, keeping industry here results in more indirect jobs and a healthier economy.

He adds that the increase in factory automation might require more and different ways to measure economic size and growth. "In the past, there was a high correlation between labor and unit sales, but that's changing. The ratio of variable costs to fixed costs is decreasing. That means fewer people are needed to push out the same number of goods. We are not going to measure economic growth by numbers of employees, but by production or sales," explains Dr. Michael.

In a recent article in the Labor Department's *Monthly Labor Review*, Sar Levitan and Clifford Johnson discussed several theories on the potential effects of automation on work. They conclude that while some agree on how fast the changes might occur, there's no consensus as to what the results will be.

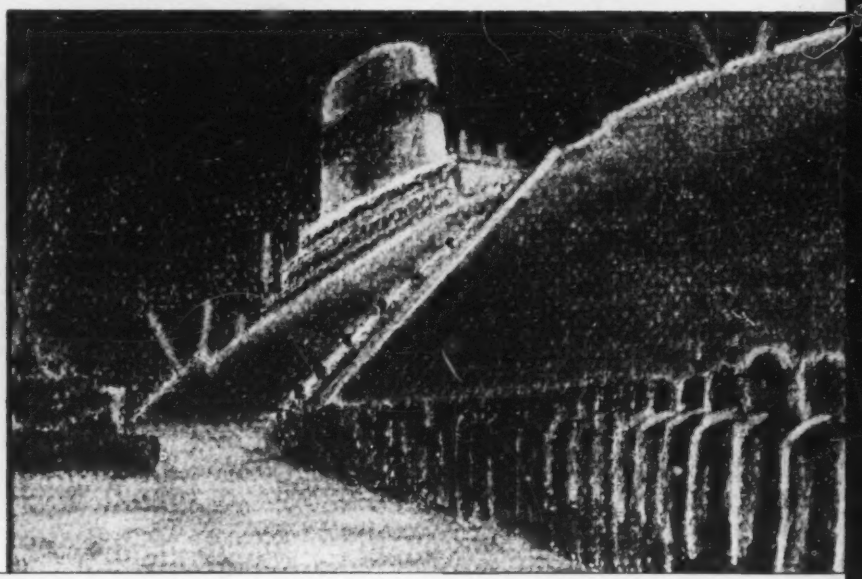
"There is general agreement that office technologies will be changing rapidly, but little indication of whether the result will be reduced office employment, shifts in future employment growth, or simply higher levels of productivity in white-collar settings," according to their findings. Most important, they conclude that while the potential for replacing large numbers of workers with automation is great and close at hand, it does "not reflect the rate at which new technology will actually be introduced to the workplace. . . . [P]redictions of immediate and massive job losses tend to ignore the market forces which slow the pace of technological change." They point out that many factors, including the size of required investment and the rate of capacity utilization, act to moderate the absorption of automated technologies.

Dr. Michael agrees that it will be a "long time" before the technology is coordinated enough to make the truly automated factory practical and inexpensive on a large scale. When that does happen, it's "going to be gradual enough so that there are no disruptive effects. The current plant closings due to lack of business are much more disruptive" to the labor force than the effect of automation is expected to be, according to Dr. Michael.

Last year, a Congressional Budget Office study sounded the alarm: ". . . [A]utomation could eliminate 200,000 manufacturing jobs in the automobile industry by 1985. . . . [P]roductivity improvements will reduce the workforce of integrated steel producers by 2 or 3 pct each year through 1990. . . . [I]ndustrial robots could eliminate one to three million jobs in the near future and possibly up to seven million by the year 2000."

The study does not try to predict how the workforce will be structured 20 years from now; rather, it asks what

Export of hi-tech jobs is expected now that production is simplified, requiring few skills.



those workers displaced by the changes will do during the transition and how the government can help.

Bennett Harrison's New England study, Labor Department studies and others confirm that displaced skilled workers are not being reabsorbed into new high-growth industries. The reasons are many and varied. Many of today's industrial workers have specific skills not easily transferred to other jobs. Many have inadequate job-market information, leading either to unrealistic job aspirations or ignorance about job opportunities. Displaced workers often are reluctant to relocate, for financial and non-financial reasons. The newer jobs can mean a reduction in pay because of loss of seniority and lower levels of unionization.

Furthermore, the Congressional Budget Office study projects a mismatch may be developing between the demand for work and the supply of jobs.

"Engineers and computer personnel, for example, as well as other white-collar workers should enjoy ample opportunities for work. . . . At the same time, however, workers from traditional manufacturing industries—usually blue-collar workers—already predominate among the displaced, and most do not have the skills to fill available jobs in the growth industries," according to the study.

Bennett Harrison found that in New England, very few workers—young and old—who left the mill industries after 1958, found work in the high technology industries in the region. Nearly three-quarters of the 833,000 people working in the mills in 1958 left. "By 1975, only 18,000 of them—fewer than 3 pct—were employed in the high-tech industries of the region. (Another 2,000 had migrated to high-tech jobs outside of New England.) Most went into the service sector . . . , dropped out of the labor force, or had no job at all. Only an eighth of the group had retired by 1975," according to the study.

Of the 131,000 who were under twenty-five in 1958 and subsequently left the mills, only 5,000 were working in the region's hi-tech industries in 1975. The MIT professor found that hi-tech companies in New England hire young, inexperienced people out of school and the home, and recruit the more experienced workers form each other.

Dr. Harrison sees a widening gap developing, a polarization of job requirements, contradicting theories that technical changes eliminate mainly jobs for the unskilled: ". . . [T]here is evidence that the rationalization of the labor process tends disproportionately to eliminate jobs falling into the middle of the earnings distribution, between those requiring little or no skill . . . and those given over to supervision and management."

In their study of the educational implications of high technology, Henry M. Levin and Russell Rumberger, of Stanford Univerity's Institute for Research on Educational Finance and Governance, found that the total number of new jobs generated by high technology from 1978-1990 will be "vastly outweighed by employment growth in other areas." Surprised?

The study shows that of the 20 occupations expected to generate the most growth in this period, not one is related to high technology. "The five occupations expected to produce the most new jobs are all in low-skilled areas: janitors, nurses' aides, sales clerks, cashiers, and waiters and waitresses." They predict employment growth for the economy as a whole will favor low and middle-level occupations. If that forecast holds true, what skills and education will industry require from its workers?

Education

Politicians press for more math/science education, but forecasts show low-skill jobs will be in greatest supply.

Cries from hi-tech industries about employee shortages and concern about foreign competitors catching up have sparked a kind of "Sputnik" response from industry, educators and politicians.

They are demanding programs for more math and science in the schools, funding to retrain workers, and other plans for attacking the problem. Congress proposed the Emergency Mathematics and Science Education Bill to offer $325 million in block grants to schools and colleges to improve programs geared toward high technology.

But it is not clear if workers of the future will need substantially more or different skills; second, assuming they need more skills, if we are targeting the appropriate ones; and third, if the programs will do anything about the problems industry and workers face *today*?

The Levin-Rumberger study concluded that most new jobs will *not* require new and different skills. "Indeed,

one of the major purposes and effects of high technology is to simplify or reduce the skill requirements for performing a particular work task. With the exception of a relatively small number of highly specialized positions for designing and implementing high-technology applications, most jobs will not require higher skills levels. . . . [T]he preponderance of persons affected by such shifts will not need more mathematics or computer science," they concluded.

In fact, as new technologies are refined, their ease of application increases. Today's operator of a computer numerically controlled lathe can be taught to produce a part much more quickly than could his counterpart of 30 years ago, even though the equipment today is much more sophisticated.

Some analysts expect there will be great demand for skilled technicians to service all the complicated automated equipment that will be in our factories. But we are well beyond the age where one had to understand how a car worked to drive and repair it. Service technicians today already run diagnostics on a piece of equipment and let the computer tell them where the problem is. Modular design makes repair fast and simple. The point is, we won't need trained engineers to do that kind of work.

Nonetheless, few will dispute the importance of having a well-educated population whatever the specific requirements of industry might be. "There's a danger if you don't have an educated population. . . . One thing we've learned is that by making educational opportunities broadly based, we all benefit because we don't know in advance who the bright lights are," offers Dr. Berg of Carnegie-Mellon.

Dr. Michael argues that less differentiation of labor means fewer specific or detailed skills needed, but that society will require more computer literacy and the ability to think logically.

Dr. Laurence Berlowitz, provost, Clark University, says there is a continuing pressing need for design engineers with a whole range of skills. He adds, "In general, the main problems are that we don't have the basic skills: writing, reading and conceptual skills."

Those in higher education complain they can't compete with private industry salaries to attract top engineers to the field of teaching or hold onto the ones they have. The result may be a shortage of highly trained and educated people to become the technological innovators of tomorrow, not a lack of programmers and technicians who can be trained on the job.

Outlook

American industry—basic and hi-tech—will have to adjust to stay competitive.

High technology will mean changes in all industries, adjustments in our thinking as managers and individuals. Some believe the demographics pointing to smaller numbers entering the job force in the 1990s are in our favor. Michael Wachter, professor at University of Pennsylvania's Wharton School, calculates that the aging of the baby boom generation and the abundant supply of experienced workers will push us into a highly skilled economy; we simply won't have the younger workers to fill the lower-skilled jobs.

The flip side, of course, is that the abundance of job opportunities on the lower end, combined with stiff competition for the better jobs, could force older, experienced workers to take low-skill jobs. We also may have to adjust upward the acceptable level of unemployment in this country.

Individual stockholders and managers may have to shift to more long-term expectations. Companies simply are going to have to invest more money into high technology—whether they're developing it or buying it—and that will mean reduced short-term returns for investors. Venture capitalists, demanding three-to-five year payback, may sour on hi-tech as it requires constant infusions of capital into R&D to stay competitive.

"U.S. investment in research and development is nowhere near as much as our competitors'. We're taking short-term investments, not the risky investments that may not pay off for a long time," laments Ira Magaziner. "If we continue this way, we're going to be in trouble in five years," he adds.

Government also may have to adjust regulations on everything from imports to cooperation among industry competitors, as an accommodation to the change in all industries brought on by high technology.

In its efforts to maintain fair business practices, the Government has enacted laws to provide for free trade and competition for U.S. goods and services sold here and to foreign buyers. The result is an unrestricted flow of goods into the country and a restricted flow of information between U.S. companies in the same industry.

Some policy analysts believe that we will have to institute a limited form of trade protection to spur our basic industries and to maintain the margins of our hi-tech industries. They point out such protection has only helped, not hurt, our European and Japanese competitors.

Many in the newer industries support an easing of antitrust laws to permit companies to pool resources in early stages of research and development. Others say industry must increase its ties with university research and look for more commercial applications based on basic research findings.

Already such academic heavyweights as Stanford and MIT are beneficiaries of funding for microelectronics research centers from such industry leaders as General Electric, Hewlett-Packard, IBM, Intel and United Technologies. Westinghouse Electric is working with Carnegie-Mellon's Robotics Institute to develop robots for industrial use. California, Arizona, Minnesota and North Carolina state governments all have appropriated funds for industry-university programs in high technology.

The real burden of keeping one step ahead in high technology will fall to the managers. They will have to initiate the long-term spending on R&D, the long-term investments in advanced capital equipment, the joint company-company or industry-university research partnerships. Dr. Berlowitz of Clark University hopes managers in industries producing and using high technologies will be up to the task.

"We need more training of managers for high-technology industries. We need managers with more technical knowledge. Top-line management is not always knowledgeable of what's going on in research, so it's not easy for them to react quickly to change and take advantage of new technologies and assimilate them into the corporate structure," says Dr. Berlowitz.

The growth potential of hi-tech *manufacturing* industries is relatively small compared to the last peak of auto and steel manufacture. Experts agree the real potential of high technology is in the impact of its implementation, the changes it will bring to all our industries—manufacturing and services—to make them more productive and more competitive. □

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EFFECTIVE MARCH 28, 1983

MATERIALS NEWSFRONT

Important Notice About Iron Age Scrap Prices

Beginning with the Jan. 21 issue Iron Age has been publishing only one set of scrap prices per issue—those with the effective date as close to the issue date as printing schedules permit. Prices for other weeks are available on a weekly basis through our Metal Price Phone Hotline or through our Weekly Price Newsletter.

Lake Superior Ore Prices

51.50% Fe Natural delivered lower Lake ports. Rail transportation, handling and unloading may be charged to the account of the buyer. Coarse ore 80¢ premium.

Pellets (per iron unit natural)..... gross-ton 80.50-86.9*
Old range, non-bessemer ..... gross-ton $32.78
Mesabi, regular-unscreened ..... gross-ton $32.53
Mesabi, non-bessemer.....gross-ton $32.25-32.53**

*80.50¢—Pickands Mather as of 1/27/81.
**86.9¢—U. S. Steel as of 3/15/82. Cleveland-Cliffs as of 2/26/82, Oglebay Norton as of 3/25/82, and Hanna Mining as of 2/26/82.

Steel Production, Composite Prices

(Effective March 28, 1983)

U.S. Steel Production	Last Week	Two Weeks Ago	To Date 1983	To Date 1982
Net tons, in thousands	1,651	1,585	17,133	21,268
Capability Utilization Rate	57.0	54.7	48.7	59.5

Composite Prices	This Week	Week Ago	Month Ago	Year Ago
Finished Steel Base* (¢/lb.—eff. 2/14/83)	26.217	26.217	26.217	25.195
Pig Iron** (Net ton= 2000 lbs.)	$213.00	$213.00	$213.00	$213.00
Scrap No. 1 hvy.*** (Gross ton=2240 lbs.)	$ 72.83	$ 72.83	$ 73.83	$ 78.83
No. 2 bundles	$ 51.83	$ 51.83	$ 51.83	$ 51.83
Scrap Comparison (Gross Ton)				
No. 1 steel, Pittsburgh .	$ 77.50	$ 77.50	$ 80.50	$ 86.50
No. 1 steel, Philadelphia	63.50	63.50	63.50	75.50
No. 1 steel, Chicago.....	77.50	77.50	77.50	74.50
No. 1 bundles, Detroit..	76.50	76.50	76.50	73.50
Low Phos., Youngstown	69.50	69.50	69.50	90.50
No. 1 mach'y cast., Pgh	79.50	79.50	79.50	86.50
No. 1 mach'y cast., Phila	98.50	98.50	98.50	113.50
No. 1 mach'y cast., Chi..	112.50	112.50	112.50	124.50

*Finished Steel Composite
Weighted index of steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.

**Pig Iron Composite
Based on average prices for basic and foundry pig iron at representative producing points within the U.S.

***Steel Scrap Composite
Average of No. 1 hvy. melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

Nonferrous Prices

(Effective March 28, 1983)
Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated.

Primary Metal Prices

(cents per lb.)	current price	last price	date of change
Aluminum	76.00 (Nom.)	76.00-80.00	1/4/82
Copper (C)	77.00-78.00	76.00-78.00	3/25/83
Lead	20.50-23.00	20.00-23.00	3/10/83
Magnesium Ingot	134.00	125.00	6/1/81
Nickel	329.00	350.00	11/25/81
Titanium Sponge	555.00-585.00	555.00	4/29/82
Zinc	38.00-40.00	40.00	3/1/83

ALUMINUM: 99.5%. COPPER (C) = cathode. LEAD: common grade. MAGNESIUM: 99.8% pig, Velasco, Tex. NICKEL: electro., Port Colborne, Canada. ZINC: high grade.

Antimony, American Laredo, Texas .$2.00
Beryllium-aluminum 5% Be, per lb. contained Be.....$201.00
Beryllium-copper, per lb. cont. Be $130.00
Beryllium 97% powder 200.....$166.00
Bismuth, ton lots .....$1.55-$1.60
Cadmium, under one ton .....$1.05-$1.15
Calcium, ton lots, crown $3.05
Chromium, 99.8% $3.75
Cobalt, 99%, cathode.....$12.50
Gold per troy oz. $408.75
Indium, dollars per troy oz.....$3.10
Iridium, dollars per troy oz.....$600
Magnesium sticks, 10,000 lbs. $1.91
Mercury, per 76-lb. f.o.b. N.Y. ..$325-$345
Molybdenum, lb. tech. moly oxides, 20 lb. MO can $5.85
Nickel oxide sinter at U.S. points of entry $3.12
Palladium, per troy oz. $140
Platinum, per troy oz.....$475
Rhodium, per troy oz. $600.00
Silver ingots, per troy oz.....$10.335
Vanadium $4.94
Zirconium sponge.....$12.00-$17.00
(Per lb. unless otherwise noted)

Straits Tin Price

(U.S. cents per lb, EX-SMELTER, based on daily market in Penang in Malaysian dollars per kilo.)

Mar. 21—602.26 Mar. 24—602.70
Mar. 22—602.70 Mar. 25—602.03
Mar. 23—601.73

Scrap Prices

Brass Mill Scrap

(Cents per lb; over 20,000 lbs. add 1¢ per lb)

	Solids	Turning
Copper	73½	64¼
Yellow brass	62¼	61¼
Red brass	67½	66⅛
Comm. bronze	69	67¾
Mang. bronze	61	59⅛
Free cutting rod ends	59	58

Custom Smelters Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	68
No. 2 copper wire	58
Light copper	49

Ingot Makers Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	64
No. 2 copper wire	54
Light copper	45
No. 1 composition	53
No. 1 comp. turnings	49
Hvy. yellow brass solids	36
Hvy. yellow brass turnings	27
Radiators	43

Aluminum

New mixed clips	34	—35
Old sheet	32	—33
Old cast	32	—33
Clean dry borings	33	—34

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Aluminum

Segregated clippings	27	—28
Mixed L.C. clips	24	—25
Old sheets and cast	19	—20
Borings and turnings	13	—14
Duraluminum clippings	22	—23

Copper and Brass

No. 1 copper wire	58	—59
No. 2 copper wire	51	—52
Light copper	44	—45
Radiators	37	—38
No. 1 composition	46	—47
No. 1 composition turn'gs	42	—44
Cocks and faucets	32	—33
Clean heavy yellow brass	31	—32
Brass Pipe	31	—32
New soft brass clippings	46	—47

Lead

Heavy soft lead	10	—11
Whole batteries	4	— 5
Type metal	15	—16
Electrotype	17	—18

Nickel

Nickel solids	95	—100
Nickel rod ends	95	—100
Nickel sheets, clips	95	—100
Nickel turnings	45	— 50

Zinc

New zinc clippings	15	—16
Old diecast zinc	9	—10

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EFFECTIVE MARCH 28, 1983

MATERIALS NEWSFRONT

(Effective March 28, 1983) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated. Prices are the opinions of *Iron Age* editors and correspondents, based on contacts with dealers, brokers, generators and users in the industry on the effective date listed above.

Ferrous Scrap Prices

Pittsburgh

No. 1 hvy. melting	$ 77.00 to	$ 78.00
No. 2 hvy. melting	67.00 to	68.00
No. 1 dealer bundles	85.00 to	86.00
No. 1 factory bundles (auto)	85.00 to	86.00
No. 2 bundles	54.00 to	55.00
No. 1 busheling	85.00 to	86.00
Machine shop turn.	9.00 to	10.00
Shoveling turnings	31.00 to	32.00
Cast iron borings	30.00 to	31.00
Low phos. punchings plate	91.00 to	92.00
Heavy turnings	67.00 to	68.00
No. 1 RR hvy. melting	85.00 to	86.00
Rails 2 ft. and under	96.00 to	97.00
Scrap rails, random lgth.	88.00 to	89.00
RR specialties	93.00 to	94.00
No. 1 machinery cast	79.00 to	80.00
Cupola cast	72.00 to	73.00
Heavy breakable cast	30.00 to	31.00
Stainless		
18-8 bundles and solids	565.00 to	575.00
18-8 turnings	465.00 to	475.00

Chicago

No. 1 hvy. melting	$ 77.00 to	$ 78.00
No. 2 hvy. melting	66.00 to	67.00
No. 1 dealer bundles	87.00 to	88.00
No. 1 factory bundles (auto)	91.00 to	92.00
No. 2 dealer bundles	54.00 to	55.00
No. 1 busheling	84.00 to	85.00
Shredder scrap	80.00 to	81.00
Machine shop turn.	14.00 to	15.00
Mixed bor. and turn.	15.00 to	16.00
Shoveling turnings	19.00 to	20.00
Cast iron borings	41.00 to	42.00
Low phos. forge crop	92.00 to	93.00
Low phos. punchings plate 1/4 in. and heavier	98.00 to	99.00
Low phos. 2 ft. and under	92.00 to	93.00
No. 1 RR hvy. melting	84.00 to	85.00
Scrap rails, random lgth.	76.00 to	77.00
Reroller rails	101.00 to	102.00
Rails, 2 ft. and under	97.00 to	98.00
RR couplers and knuckles	86.00 to	87.00
RR car axles	109.00 to	110.00
No. 1 machinery cast	112.00 to	113.00
Cupola cast	97.00 to	98.00
Stove plate	94.00 to	95.00
Steel car wheels	86.00 to	87.00
Stainless		
18-8 bundles and solids	515.00 to	525.00
18-8 turnings	415.00 to	425.00
430 bundles and solids	130.00 to	135.00
430 turnings	95.00 to	100.00

Philadelphia

No. 1 hvy. melting	$ 62.00 to	$ 65.00
No. 2 hvy. melting	54.00 to	57.00
No. 1 dealer bundles	79.00 to	82.00
No. 2 dealer bundles	45.00 to	48.00
No. 1 busheling	79.00 to	82.00
Shredder scrap	77.00 to	80.00
Machine shop turn.	23.00 to	26.00
Mixed bor. and turn.	23.00 to	26.00
Shoveling turnings	40.00 to	43.00
Low phos. 5 ft. and under	79.00 to	82.00
Low phos. 2 ft. punchings	91.00 to	94.00
Electric furnace bundles	95.00 to	98.00
RR specialties	79.00 to	82.00
Rails, 2 ft. and under	93.00 to	96.00
Cupola cast	60.00 to	63.00
Heavy breakable cast	53.00 to	56.00
No. 1 machinery cast	97.00 to	100.00

Detroit

Broker buying prices per gross ton on cars:		
No. 1 hvy. melting	$ 52.00 to	$ 53.00
No. 2 hvy. melting	50.00 to	51.00
No. 1 dealer bundles	76.00 to	77.00
No. 2 bundles	32.00 to	33.00
No. 1 busheling	73.00 to	74.00
Drop forge flashings	47.00 to	48.00
Machine shop turn.	29.00 to	30.00
Mixed borings and turn.	14.00 to	15.00
Shoveling turnings	29.00 to	30.00
Cast iron borings	13.00 to	14.00
Heavy breakable cast	32.00 to	33.00
Mixed cupola cast	48.00 to	49.00
Automobile cast	69.00 to	70.00
Stainless		
18-8 bundles and solids	470.00 to	480.00
18-8 turnings	350.00 to	360.00
430 bundles and solids	120.00 to	130.00

Youngstown

No. 1 hvy. melting	$ 67.00 to	$ 68.00
No. 2 hvy. melting	59.00 to	60.00
No. 1 dealer bundles	79.00 to	80.00
No. 2 dealer bundles	39.00 to	40.00
Machine shop turn.	2.00 to	3.00
Shoveling turnings	7.00 to	8.00
Low phos. plate	69.00 to	70.00
Electric furnace bundles	75.00 to	76.00
Galvanized bundles	65.00 to	66.00

Cleveland

No. 1 hvy. melting	$ 69.00 to	$ 70.00
No. 2 hvy. melting	29.00 to	30.00
No. 1 dealer bundles	77.00 to	78.00
No. 1 factory bundles	86.00 to	87.00
No. 2 bundles	24.00 to	25.00
No. 1 busheling	77.00 to	78.00
Machine shop turn.	2.00 to	3.00
Mixed bor. and turn.	2.00 to	3.00
Shoveling turnings	5.00 to	6.00
Cast iron borings	5.00 to	6.00
Cut structural & plates, 2 ft. and under	95.00 to	96.00
Low phos. punchings plate	95.00 to	96.00
Drop forge flashings	33.00 to	34.00
Foundry steel, 2 ft. & under	59.00 to	60.00
No. 1 RR hvy melting	63.00 to	64.00
Rails, 2 ft. and under	99.00 to	100.00
Rails, 18 in. and under	100.00 to	101.00
Steel axle turnings	69.00 to	70.00
Railroad cast	82.00 to	83.00
No. 1 machinery cast	89.00 to	90.00
Cupola cast	62.00 to	63.00
Stove plate	47.00 to	48.00
Stainless		
18-8 bundles	275.00 to	285.00
18-8 turnings	225.00 to	235.00
430 bundles	75.00 to	85.00

Buffalo

No. 1 hvy. melting	$ 33.00 to	$ 34.00
No. 2 hvy. melting	23.00 to	24.00
No. 1 busheling	38.00 to	39.00
No. 1 dealer bundles	36.00 to	38.00
No. 2 bundles	20.00 to	21.00
Machine shop turn.	9.00 to	10.00
Mixed bor. and turn.	16.00 to	17.00
Shoveling turnings	18.00 to	19.00
Cast iron borings	15.00 to	16.00
Low phos. plate	56.00 to	57.00
Structural and plate, 2 ft. and under	54.00 to	55.00
Rails, 2 ft. and under	50.00 to	51.00
Scrap rails, random lgth.	30.00 to	31.00
No. 1 machinery cast	71.00 to	72.00
No. 1 cupola cast	48.00 to	49.00

St. Louis

No. 1 hvy. melting	$ 64.00 to	$ 65.00
No. 2 hvy. melting	53.00 to	54.00
Foundry steel, 2 ft.	53.00 to	54.00
No. 1 dealer bundles	64.00 to	65.00
No. 2 bundles	50.00 to	51.00
Machine shop turn.	12.00 to	13.00
Shoveling turnings	18.00 to	19.00
Cast iron borings	30.00 to	31.00
No. 1 RR hvy. melting	64.00 to	65.00
Rails, random length	61.00 to	62.00
Rails, 18 in. and under	76.00 to	77.00
RR specialties	80.00 to	81.00
Cupola cast	70.00 to	71.00
Heavy breakable cast	48.00 to	49.00
Stove plate	82.00 to	83.00
Cast iron car wheels	49.00 to	50.00
Rerolling rails	96.00 to	97.00
Unstripped motor blocks	55.00 to	56.00

Birmingham

No. 1 heavy melting	$ 58.00 to	$ 59.00
No. 2 heavy melting	56.00 to	57.00
No. 1 dealer bundles	58.00 to	59.00
No. 2 bundles	43.00 to	44.00
No. 1 busheling	58.00 to	59.00
Shredder scrap	74.00 to	75.00
Machine shop. turn.	21.00 to	22.00
Shoveling turnings	31.00 to	32.00
Cast iron borings	31.00 to	32.00
Electric furnace bundles	58.00 to	59.00
Elec. furnace, 3 ft. & under	56.00 to	57.00
Structural and plate, 2 ft.	79.00 to	80.00
Structural and plate, 4 ft.	71.00 to	72.00
No. 1 RR hvy. melting	59.00 to	60.00
Scrap rails, random lgth.	60.00 to	61.00
Rails, 18 in. and under	79.00 to	80.00
Angles and splice bars	73.00 to	74.00
No. 1 cupola cast	77.00 to	78.00
Unstripped motor blocks	52.00 to	53.00

Cincinnati

Brokers buying prices per gross ton on cars:		
No. 1 hvy. melting	$ 53.00 to	$ 54.00
No. 2 hvy. melting	52.00 to	53.00
No. 1 dealer bundles	59.00 to	60.00
No. 2 bundles	30.00 to	31.00
Machine shop turn.	6.00 to	7.00
Shoveling turnings	10.00 to	11.00
Cast iron borings	11.00 to	12.00
Low phos. 18 in. and under	78.00 to	79.00
Rails, random length	60.00 to	61.00
Rails, 2 ft. and under	82.00 to	83.00
No. 1 cupola cast	65.00 to	66.00
Heavy breakable cast	29.00 to	30.00
Drop broken cast	69.00 to	70.00

New York

Brokers buying prices per gross ton on cars:		
No. 1 hvy. melting	$ 34.00 to	$ 35.00
No. 2 hvy. melting	30.00 to	32.00
No. 2 dealer bundles	22.00 to	23.00
Mixed bor. and turn.	7.00 to	8.00
Machine shop turn.	4.00 to	5.00
Shoveling turnings	10.00 to	12.00
Clean cast. chem. borings	34.00 to	35.00
No. 1 machinery cast	89.00 to	90.00
Mixed yard cast	38.00 to	39.00
Heavy breakable cast	14.00 to	15.00
Stainless		
18-8 prepared solids	455.00 to	475.00
18-8 turnings	340.00 to	365.00
430 prepared solids	70.00 to	80.00
410 solids	60.00 to	70.00

Boston

Brokers buying prices per gross ton on cars:		
No. 1 hvy. melting	$ 38.00 to	$ 40.00
No. 2 hvy. melting	28.00 to	30.00
No. 1 dealer bundles	40.00 to	42.00
No. 2 bundles	29.00 to	31.00
No. 1 busheling	40.00 to	42.00
Shredder scrap	43.00 to	45.00
Machine shop turn.	3.00 to	5.00
Shoveling turnings	7.00 to	9.00
No. 1 machinery cast	105.00 to	110.00
Mixed cupola cast	28.00 to	30.00
Heavy breakable cast	8.00 to	10.00

San Francisco

No. 1 hvy. melting	$ 41.00 to	$ 43.00
No. 2 hvy. melting	33.00 to	35.00
No. 1 dealer bundles	28.00 to	30.00
No. 2 dealer bundles	12.00 to	14.00
Machine shop turn.	4.00 to	6.00
Cast iron borings	4.00 to	6.00
No. 1 cupola cast	83.00 to	85.00

Los Angeles

No. 1 hvy. melting	$ 40.00 to	$ 42.00
No. 2 hvy. melting	29.00 to	31.00
No. 1 dealer bundles	27.00 to	29.00
No. 2 dealer bundles	9.00 to	11.00
Machine shop turn.	4.00 to	6.00
Shoveling turnings	8.00 to	10.00
Cast iron borings	4.00 to	6.00
Elec. furnace, 1 ft. and under (foundry)	84.00 to	86.00
No. 1 cupola cast	86.00 to	88.00

Seattle

No. 1 hvy. melting	$ 58.00 to	$ 60.00
No. 2 hvy. melting	47.00 to	49.00
No. 2 bundles	36.00 to	38.00
No. 1 cupola cast	92.00 to	94.00
Mixed yard cast	79.00 to	81.00

Hamilton, Ont.

Brokers buying price per net ton on cars:	
No. 1 heavy melting	$ 55.00
No. 2 heavy melting cut 2 ft. and under	52.00
No. 1 dealer bundles	60.00
No. 2 bundles	30.00
Mixed steel scrap	34.00
Bush. new fact. prep'd.	58.00
Bush. new fact. unprp'd.	50.00
Machine shop turn.	25.00
Short steel turn.	28.00
Mixed bor. and turn.	15.00
Cast scrap	48.00

Houston

Brokers buying prices per gross ton on cars:		
No. 1 hvy. melting	$ 64.00 to	$ 65.00
No. 2 hvy. melting	49.00 to	50.00
No. 2 bundles	34.00 to	36.00
Machine shop turn.	18.00 to	19.00
Crushed turnings	33.00 to	35.00
Shredder scrap	64.00 to	65.00
Cut structural plate 2 ft. and under	84.00 to	86.00
Unstripped motor blocks	60.00 to	62.00
Cupola cast	69.00 to	71.00

METALWORKING ORDER TRENDS

Orders slippage is no worry; blame it on the Pentagon

After three straight months of gains in new orders for durable goods, February turned out to be a clunker.

These orders in February fell by 3.1 pct from the pace set in the opening month of the year. In dollars, the decline was from $80.9 billion to $78.4 billion.

It is not likely the February decline marks the end of a longer term upswing. For one, just about all of the February dip was centered in the very volatile defense industry capital goods sector. These orders totaled $6.1 billion in February, down sharply from January's $8.9 billion volume.

Too, it could hardly be expected that the hot pace of January would continue through February. Orders in January had jumped by about 6 pct.

Taking a bit longer view, it is reassuring that the orders' dollar volume in February was 13 pct above the October 1982 starting point of the recent climb.

Despite the orders softness in February, it seems there are few economists or business executives who view that one-month showing as meaning business recovery hasn't come or won't come.

On the other hand, not many seem to think the recovery in durable goods new orders—especially, capital goods orders—is going to be a strong one. At least, not for some time yet. Near-record high real long-term interest rates remain a block to any strong recovery in orders.

Corporations are using much of the money they earn or borrow at this time to rebuild their recession-torn balance sheets.

That means any strong step-up in buying plans for the big-ticket items will have to wait.

For the six major metalworking industry groups shown on the table here—primary metals, electrical and nonelectrical machinery, transportation equipment, fabricated metal products and instruments—orders, at $66.2 billion in February, were off 2.9 pct from January.

But it was a mixed-bag showing. Primary metals has a good month for orders, up from $8.2 billion to $9.6 billion. Also, fabricated metal products were up almost 4.5 pct to $9.6 billion.

Instruments managed to hold their own as orders weakness hit in the machinery and transportation equipment industries.

Source: U.S. Dept. of Commerce Billions of dollars, seasonally adjusted monthly total, unless otherwise noted		Latest Month or Qtr.	Previous Month or Qtr.	Same Period Year Ago
Capital Expenditures (Annual Rates)				
U.S. Industry, Total	1st Qtr.	$316.4*	$315.2	$327.7
Manufacturing, Total	1st Qtr.	121.4*	120.5	128.5
Manufacturing, Durable Goods	1st Qtr.	57.9*	55.8	60.8
Mining Industry	1st Qtr.	16.2*	15.6	17.6
Key Indicators, Durable Goods Manufacturing				
New Orders	Feb.	78.4	80.9	76.4
Shipments	Feb.	77.4	77.3	79.8
Inventories	Feb.	173.5	174.0	184.5
Unfilled Orders	Feb.	289.7	288.8	308.7
New Orders, Metalworking				
Capital Goods Producers, Nondefense Industries	Feb.	25.1	29.3	20.5
Capital Goods Producers, Defense Industries	Feb.	6.1	8.9	8.7
Primary Metals, Total	Feb.	9.8	8.2	8.6
Steel (SIC 331)	Feb.	4.1	3.4	4.0
Iron & Steel Castings (SIC 332)	Feb.	0.8	0.8	0.8
Nonferrous Metals	Feb.	4.9	4.0	3.8
Nonelectrical Mach.-Equip. Industries, Total	Feb.	12.5	13.3	14.6
Engines & Turbines	Feb.	1.0	1.0	1.4
Farm Machinery & Equipment (Shipments)	Feb.	0.8	0.9	1.0
Construction, Mining & Materials Hdlg. Equip.	Feb.	1.8	1.8	2.9
General Industrial Machinery	Feb.	1.2	1.1	1.3
Fluid Power Equipment** (Index-1972=100)	Feb.	198	207	237
Metalworking Machinery	Feb.	0.6	0.6	0.7
Machine Tools, Total (Millions $, unadjusted)***	Feb.	98.0	91.9	163.8
Machine Tools, Metal-Cutting***	Feb.	77.9	57.1	123.2
Machine Tools, Metal-Forming***	Feb.	20.1	34.8	40.6
Electrical Mach. & Equip. Industries, Total	Feb.	12.2	12.0	11.3
Elec. Transmission Equip. & Industrial Apparatus	Feb.	1.7	1.4	1.6
Household Appliances	Feb.	1.1	1.3	0.9
Communication Equipment	Feb.	4.2	3.9	3.6
Transportation Equip. Industrial, Total	Feb.	18.1	21.5	19.1
Motor Vehicles & Parts (Shipments)	Feb.	11.3	10.3	10.0
Aircraft, Missiles & Parts	Feb.	5.6	8.5	7.2
Shipbuilding & Military Tanks	Feb.	0.4	1.9	1.4
Fabricated Metal Products, Total	Feb.	9.6	9.2	9.6
Instruments, Total	Feb.	4.0	4.0	4.3

*Est.—Commerce Dept.; **Source: National Fluid Power Assn.; ***Source: NMTBA.

NOTE

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Cover 1, p.3, 29-31, 66-67.